Effects of Electric Current

01/07/2020 – Class 7

Activity 1

Answer of Assignments

2 Ω and 4 Ω resistors are connected in parallel. 12 V potential difference is applied. Find current in the circuit?

$R_1 = 2\ \Omega$, $R_2 = 4\ \Omega$, $V = 12$ V

$1/R = 1 / R_1 + 1/ R_2$

$= 1/2 + 1/4 = 6/8 = 3/4$

$R = 4/3\ \Omega$

Current in the circuit , $I = V/R$

$= 12 \times 3 /4 =$ **9 A**

Activity 2

Discussion – What is power?

> All electrical appliances use electrical energy to perform work.

- What is the work done by an electric bulb? **Convert electrical energy to light energy and heat energy.**
- What is the work done by an electric heater? **Convert electrical energy to heat energy**

> If an electrical device performs **W** joule work in **t** second
> Work done in **1** second = **W / t**

Inference

Work done in (unit time) 1 second is known as its power.

> **Power (P) = Work(W) / Time(t)**

> Unit of power = **J/s= W**
> **1J/1s = 1 W**

> ## One Watt
> If an electrical appliance consume one joule electrical energy in unit time, then its power is one watt.

Activity 3

Power and Voltage are marked on electrical appliances. Observe two electric bulbs. **230 V 40 W**, is marked on the first bulb and **230 V 100 W** is marked on the second bulb. Glowing the above bulbs one by one by connecting to an electric supply.

Observations
- 100 W bulb produce more light.
- 40 W bulb produce less light.

Discussion
- During the working of 40 W bulb, how much electrical energy was converted to light energy and heat energy in one second? **40 J**
- 100 W bulb converts how much electrical energy to light energy and heat energy in one second? **100 J**

> ### Power
> Power of an electrical appliance is the amount of electrical energy consumed by the electrical appliance in one second.
> Unit of power is **watt(W)**

- What is the work done by a heating device? **Converts electrical energy to heat energy.**

If **H** joule heat energy is generated in **t** second,

> then heat energy generated in 1 second = **H / t = W/t**

Here the heat energy generated **(H)** is the work done by the device **(W)**

According to Joule's law, $\quad H = I^2 Rt$

$$P = \frac{H}{t} = \frac{I^2 Rt}{t} = \boxed{I^2 R}$$

From Ohm's law, $\quad I = \frac{V}{R}, \quad P = \left(\frac{V}{R}\right)^2 R$

$$= \frac{V^2}{R^2} \times R$$

$$= \boxed{\frac{V^2}{R}}$$

$$R = \frac{V}{I}$$

$$P = I^2 R, \quad P = I^2 \times \frac{V}{I}$$

$$P = V I$$

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Activity 3

The power of an electrical appliance is 540 W. The voltage applied to this device is 230 V. Find it's amperage?

P = 540 W, V = 230 V

Amperage = W / V

= 540 / 230 = **2.34 A = 2.4 A**

Activity 4

Resistance of an electrical appliance is 115 Ω. Current through this device is 2 A. Find its power?

R= 115 Ω , I = 2 A

P = I²R = 2 X 2 X 115 = 460 W

Activity 5

Power of an electrical appliance is 1600 W. The device work at 400 V. If we give 200 V instead of 400 V, what is its power?

P = 1600 W, V = 400 V

P = V² / R ,

R= V² / P

R = 400 X 400 / 1600 = **100 Ω**

When V = 200 V

P = V² / R = 200 X 200 / 100 = **400 W**

Inference
If voltage is decreased to half then power decreased to one fourth

Assignments

1. Complete the table ?

Resistors in series	Resistors in parallel
• Effective resistance increases	•
•	• The current through each resistor is different. It gets divided as per the value of resistors.
• The potential difference across each resistor is different. It gets divided as per the value of resistors.	•
•	• Each resistor can be controlled by using separate switches.

2. If 0.4 A current flows through a bulb which works at 230 V. What is its power?